EPR SPECTROSCOPY OF RUBY IN THE UNDERGRADUATE PHYSICAL CHEMISTRY TEACHING LABORATORY

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We describe an exercise for the undergraduate teaching lab that uses EPR spectroscopy to determine the g and D values for the chromium(III) ion in a ruby ball lens. Students use a polarized light stereomicroscope to identify the ruby c-axis; once found, ruby orientation is locked in place with a teflon screw at the end of a teflon post. The post can then be rotated in the magnetic field of an X-band EPR spectrometer using an inexpensive rotation platform. Spectra are obtained from 0 to 90 degrees in 5 degree increments; the result is a huge amount of data, which is more easily handled using Igor Pro software.[1] Resonance field positions are found and plotted as a function of angle, and the values of g and D are determined from the 0° spectrum.[2] Using their experimental g and D values, students diagonalize the spin Hamiltonian using a procedure written in Igor Pro. Calculated resonance field positions at each angle can then be compared with experimental results.

1. WaveMetrics, Inc. 10200 SW Nimbus, G-7 Portland , OR 97223
2. L.A. Collins, M.A. Morrison, P.L. Donoho Am. J. Phys., 42 (1974) 560-571.